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Paul A. Farrar

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SCHWEGMAN, LUNDBERG & WOESSNER, P.A.

P.O. BOX 2938

MINNEAPOLIS, MN 55402

EXAMINER

BLAN, NICOLE R

ART UNIT

PAPER NUMBER

1792

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/681,481	<b>Applicant(s)</b> FARRAR, PAUL A.	
	<b>Examiner</b> NICOLE BLAN	<b>Art Unit</b> 1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 18 December 2008.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-4, 6, 7, 9-11, 14-17, 20, 22-25, 41, 42 and 44-46 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-4, 6, 7, 9-11, 14-17, 20, 22-25, 41, 42 and 44-46 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |                                                                                      |                                                                   |
|--------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                     | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____                                                          | 6) <input type="checkbox"/> Other: _____                          |

### **DETAILED ACTION**

1. No claims have been amended, cancelled or added in the response filed on December 18, 2008.
2. In view of the amendment to the specification, the previous objection to the specification in the office action dated September 18, 2008 is withdrawn.

### ***Response to Arguments***

3. Applicant's arguments, see pages 9-10, filed December 18, 2008, with respect to the rejection of claims 1-4, 7, 9-11, 14-17, 20, 22-25, 41-42 and 44-46 under 35 U.S.C. 112, first paragraph have been fully considered and are persuasive in view of the amendment to the specification. The rejection of claims 1-4, 7, 9-11, 14-17, 20, 22-25, 41-42 and 44-46 has been withdrawn.
4. Applicant's arguments regarding claim 6 filed December 18, 2008 have been fully considered but they are not persuasive.
5. In response to applicant's argument regarding the rejection under 35 U.S.C. 112, first paragraph regarding claim 6, the Examiner does not find it persuasive upon reviewing the specific portion of the specification as instructed by the applicant. The Examiner reviewed the specification and she did not see supplying either simultaneously or sequentially a carrier fluid comprising a halogenated hydrocarbon and an acid. It is the Examiners understanding that the specification discussed two embodiments, one directed to using a halogenated hydrocarbon carrier fluid and the other to using an acid carrier fluid, but there was no disclosure as to the two

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chemicals being used together. As indicated by the applicant on page 8, a carrier fluid includes a subsequent cleaning or solvent solution, but this language is not clear. It is interpreted that a carrier fluid itself can be a halogenated hydrocarbon, or deionized water, or H<sub>2</sub>SO<sub>4</sub> or H<sub>2</sub>O<sub>2</sub>. As such, the rejection of claim 6 under 35 U.S.C. 112, first paragraph is maintained.

***Summary of Issues to be corrected to put Case into Condition for Allowance***

6. Applicant would place the case in condition for allowance by:
- Amending independent claims 1, 11, 22 and 41 as illustrated below in order to overcome the rejections under 35 U.S.C. 112, second paragraph
  - Amend claim 16 as illustrated below in order to place it into condition for allowance
  - Canceling claims 6 and 15
  - Correcting the status identifiers
  - Filing a terminal disclaimer over 7,303,637

Example of amended independent claim 1: A method of cleaning a semiconductor surface, comprising:

placing the semiconductor surface in contact with a halogenated hydrocarbon carrier fluid in an amount sufficient to immerse the semiconductor surface;

forming a supercritical fluid adjacent to the semiconductor surface;

changing a thermodynamic condition of the supercritical fluid to cause gas bubbles in the carrier fluid; and

concurrently brushing the semiconductor surface with the gas bubble formation.

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Example of amended independent claim 16: A method of cleaning a semiconductor surface, comprising:

placing the semiconductor surface in contact with a halogenated hydrocarbon carrier fluid in an amount sufficient to immerse the semiconductor surface;

forming a supercritical fluid adjacent to the semiconductor surface;

changing a thermodynamic condition of the supercritical fluid to cause gas bubbles in the carrier fluid; and

providing supplemental mechanical energy at the semiconductor surface in addition to the gas bubbles, including concurrently brushing the semiconductor surface with the gas bubble formation.

#### ***Additional Formal Matters***

7. In the previous office action, the Examiner withdrew the previous election restriction and re-joined the claims. Upon receiving the amendment filed on December 18, 2008, the claims did not have the proper status identifiers listed. Please correct.

#### ***Claim Objections***

8. Claim 15 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Parent claim 11 from which claim 15 depends contains a

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limitation for concurrently brushing the semiconductor surface. Claim 15 repeats the limitation of brushing the semiconductor surface.

***Claim Rejections - 35 USC § 112***

9. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

10. Claim 6 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

In claim 6, the subject matter not properly described in the application as filed is contacting a semiconductor surface with a mixture of a halogenated hydrocarbon carrier fluid which includes an acid cleaning solution.

11. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

12. Claims 1-4, 6-7, 9-11, 14-15, 22-25, 41-42 and 44-46 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

13. Claims 1, 11, 22 and 41 recite the limitation "...concurrently brushing the semiconductor surface." What step is the brushing done concurrently with? Is it placing or forming or

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changing/reducing? Also, what is the surface brushed with? Is the semiconductor surface concurrently brushed with the gas bubbles formation? It is unclear what the applicants are trying to claim.

14. Claims 2-4, 6-7, 9-10, 14-15, 23-25, 42 and 44-46 are rejected as being dependent upon a rejected claim.

### ***Claim Rejections - 35 USC § 103***

15. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

16. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

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**17. Claims 16, 17 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jackson et al (U.S. 5,013,366) in view of Tipton et al (U.S. 6,800,142), and further in view of Beaudoin (U.S. PGPub 2003/0228738, hereinafter '738).**

Claims 16, 17 and 20: Jackson teaches a method of cleaning a contaminated substrate (col.7, lines 3-5). Jackson describes a second specific embodiment wherein cleaning procedure comprises suspending (immersing) substrate in a liquid suspension medium (reads on "a carrier fluid", as claimed), such as deionized water; forming a supercritical fluid in contact with the substrate and shifting the phase of the fluid (reads on "changing a thermodynamic condition of the supercritical fluid), thus forming gas bubbles in the liquid suspension medium (Fig. 7; col. 2, lines 36-41; col.4, lines 10-13; paragraph, bridging col.10 and col.11). The supercritical fluid can be formed from carbon dioxide (col. 11, line 8). Jackson also teaches the use of mechanical energy, such as sonic energy to enhance cleaning action (col.11, lines 36-40). Regarding claim 20, Jackson does not specifically indicate the use of sonic wave energy. However, Jackson teaches that high energy sonic bursts agitate the substrate to promote the breaking of bonds between the contaminants and the substrate being cleaned (paragraph, bridging col. 11 and 12), but Tipton teaches that megasonic waves while cleaning a semiconductor (col. 3 lines 35-48). Since Jackson provides motivation to apply high energy sonic bursts, one skilled in the art would have found obvious to utilize megasonic waves as taught by Tipton while cleaning the substrate in the teaching of Jackson with the reasonable expectation of success.

The indicated second specific embodiment of Jackson remains silent about including a halogenated hydrocarbon into the cleaning process. However, describing a different embodiment, Jackson teaches using halogenated hydrocarbons as the carrier fluid for producing



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densified/supercritical fluids. Carbon dioxide, along with the carrier fluid, is also used to aid in the cleaning process (col.3, lines 35-48). Since Jackson teaches removal of photoresist, since the use of halogenated hydrocarbons within densified/supercritical fluids to enhance removal of photoresist is conventionally known in the art (see, for example the reference to Tipton), one skilled in the art motivated by Tipton would have found obvious to utilize halogenated hydrocarbon in addition to carbon dioxide while forming densified/supercritical conditions in order to enhance removal of photoresist in the second specific embodiment of Jackson.

Jackson and Tipton do not teach brushing the semiconductor surface. However, Beaudoin teaches that a process for cleaning semiconductors can include cleaning with supercritical fluids and brushes [page 1, paragraph 5]. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize brushes as taught by Beaudoin to clean the surface of the semiconductor in order to effectively remove all of the contaminants on the surface.

### ***Double Patenting***

18. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the “right to exclude” granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting

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ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

19. Claims 1-4, 6-7 and 10 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-12, 14-18, and 20-22 of U.S. Patent No. 7,303,637 in view of Jackson et al. (U.S. Patent 5,013,366, hereinafter '366).

Conflicting patent 7,303,637 teaches all of the limitations of claims 1-4, 6-7 and 10 except for the carrier fluid being a halogenated hydrocarbon. '366 teaches a similar method of cleaning a semiconductor in which the semiconductor is suspended (or immersed) in a fluid [paragraph that bridges cols. 10-11] wherein the fluid comprises halogenated hydrocarbons [col. 3, lines 35-48]. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the fluid taught by '366 as the fluid disclosed by U.S. Patent 7,303,637 because '366 discloses a similar method of cleaning in which a halogenated hydrocarbon carrier fluid is utilized in semiconductor cleaning.

20. Claims 11 and 14-15 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-2 and 8 of U.S. Patent No. 7,303,637 in view of Jackson et al. (U.S. Patent 5,013,366, hereinafter '366).

Conflicting patent 7,303,637 teaches all of the limitations of claims 11 and 14 except for the carrier fluid being a halogenated hydrocarbon and the supercritical fluid being formed from carbon dioxide. '366 teaches a similar method of cleaning a semiconductor in which the semiconductor is suspended (or immersed) in a fluid [paragraph that bridges cols. 10-11] wherein the fluid comprises halogenated hydrocarbons [col. 3, lines 35-48] and that the

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supercritical fluid can be formed from carbon dioxide [col. 11, line 8]. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the fluids taught by '366 as the fluid disclosed by U.S. Patent 7,303,637 because '366 discloses a similar method of cleaning in which a halogenated hydrocarbon carrier fluid and a carbon dioxide supercritical fluid is utilized in semiconductor cleaning.

21. Claims 16-17 and 20 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-2, 12, 15 and 18 of U.S. Patent No. 7,303,637 in view of Jackson et al. (U.S. Patent 5,013,366, hereinafter '366).

Conflicting patent 7,303,637 teaches all of the limitations of claims 16-17 and 20 except for the carrier fluid being a halogenated hydrocarbon. '366 teaches a similar method of cleaning a semiconductor in which the semiconductor is suspended (or immersed) in a fluid [paragraph that bridges cols. 10-11] wherein the fluid comprises halogenated hydrocarbons [col. 3, lines 35-48]. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the fluid taught by '366 as the fluid disclosed by U.S. Patent 7,303,637 because '366 discloses a similar method of cleaning in which a halogenated hydrocarbon carrier fluid is utilized in semiconductor cleaning.

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22. Claims 22-23 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-2, 8 and 18 of U.S. Patent No. 7,303,637 in view of Jackson et al. (U.S. Patent 5,013,366, hereinafter '366).

Conflicting patent 7,303,637 teaches all of the limitations of claims 22-23 except for the carrier fluid being a halogenated hydrocarbon and using sonic energy to enhance cleaning action. '366 teaches a similar method of cleaning a semiconductor in which the semiconductor is suspended (or immersed) in a fluid [paragraph that bridges cols. 10-11] wherein the fluid comprises halogenated hydrocarbons [col. 3, lines 35-48] and that sonic energy is used to enhance cleaning semiconductors [col. 11, lines 36-40]. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the fluid taught by '366 as the fluid disclosed by U.S. Patent 7,303,637 because '366 discloses a similar method of cleaning in which a halogenated hydrocarbon carrier fluid is utilized in semiconductor cleaning.

23. Claim 22 is rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 12 and 15-17 of U.S. Patent No. 7,303,637 in view of Jackson et al. (U.S. Patent 5,013,366, hereinafter '366).

Conflicting patent 7,303,637 teaches all of the limitations of claim 22 except for the carrier fluid being a halogenated hydrocarbon. '366 teaches a similar method of cleaning a semiconductor in which the semiconductor is suspended (or immersed) in a fluid [paragraph that bridges cols. 10-11] wherein the fluid comprises halogenated hydrocarbons [col. 3, lines 35-48]. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the fluid taught by '366 as the fluid disclosed by U.S. Patent 7,303,637 because '366

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discloses a similar method of cleaning in which a halogenated hydrocarbon carrier fluid is utilized in semiconductor cleaning.

24. Claims 41-42 and 46 is rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-2, 12, 15 and 18 of U.S. Patent No. 7,303,637 in view of Jackson et al. (U.S. Patent 5,013,366, hereinafter '366).

Conflicting patent 7,303,637 teaches all of the limitations of claims 41-42 and 46 except for the carrier fluid being a halogenated hydrocarbon. '366 teaches a similar method of cleaning a semiconductor in which the semiconductor is suspended (or immersed) in a fluid [paragraph that bridges cols. 10-11] wherein the fluid comprises halogenated hydrocarbons [col. 3, lines 35-48]. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the fluid taught by '366 as the fluid disclosed by U.S. Patent 7,303,637 because '366 discloses a similar method of cleaning in which a halogenated hydrocarbon carrier fluid is utilized in semiconductor cleaning.

25. Claims 1-4, 11, 14, 16-17, 20, 22, 41-42, and 44-46 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 23-29 of U.S. Patent No. 7,303,637. Although the conflicting claims are not identical, they are not patentably distinct from each other because, for example, claims 23-27 of the conflicting patent substantially recited the manipulative steps by claims 1-4 of the instant application. Similarly, claims 23-24 and 27 of the conflicting patent substantially recited the manipulative steps by claims 11 and 14 of the instant application. Similarly, claims 23-24 and 27 of the conflicting

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patent substantially recited the manipulative steps by claims 16-17 and 20 of the instant application. Similarly, claims 23 and 27 of the conflicting patent substantially recited the manipulative steps by claim 22 of the instant application. Similarly, claims 23-24 and 27-29 of the conflicting patent substantially recited the manipulative steps by claims 41-42 and 44-46 of the instant application.

***Allowable Subject Matter***

26. Claims 1-4, 7, 9-11, 14, 22-25, 41-42 and 44-46 would be allowable if rewritten or amended to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph as shown above as well as the rejections on the ground of nonstatutory obviousness-type double patenting by filing a terminal disclaimer over 7,303,637, set forth in this Office action.

27. The following is a statement of reasons for the indication of allowable subject matter: Jackson (U.S. Patent 5,013,366) is the closest prior art of record. Jackson does not fairly anticipate or suggest a semiconductor cleaning method with the combination of processing steps as claimed, specifically including brushing the semiconductor surface concurrently with the gas bubble formation caused by changing a thermodynamic condition of the supercritical fluid adjacent to the semiconductor surface. No other prior art anticipates or fairly suggests a cleaning method with the combination of processing steps as instantly claimed have been located to date.

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to NICOLE BLAN whose telephone number is (571)270-1838. The examiner can normally be reached on Monday - Thursday 8-5 and alternating Fridays 8-4.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Cleveland can be reached on 571-272-1418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Nicole Blan/  
Examiner, Art Unit 1792

/Michael Cleveland/  
Supervisory Patent Examiner, Art Unit 1792